

of error in arguing from a single species, that little importance should be attached to conclusions drawn from it.

Assuming them however to be specifically identical, as I myself believe them to be, and to have required precisely the same temperature, I think Prof. Haughton's case is not quite so strong as he believes. The present mean winter temperature of Bournemouth in lat. $50^{\circ} 43'$ is $37^{\circ} 4'$, but the physical surroundings of Bournemouth are not now such as conduce to luxuriant forest growth, even if its temperature sufficed, and the conditions there in the Eocene time more probably assimilated to those of the south-west coasts of Ireland at the present day.

Now the mean of the coldest month at Valentia, lat. $51^{\circ} 44'$, is 44° , and it may be fairly assumed that if Valentia were a degree farther south, corresponding to Bournemouth, the temperature would be one degree higher; and if sheltered by mountains from all the northerly winds as Glengarriff is, the mean might possibly be raised to 46° . Thus but 11° are required to reach the minimum of 57° supposed to be required by his *Araucaria*. Again, although the Moreton Bay Pine does not appear to support a less mean annual temperature than 67° to 70° between the Clarence and the Bellingen, which are its southern limits in Australia, it flourishes and ripens seeds in Madeira in a mean of 64° $96'$, and although I have only noticed it in two gardens near the sea-level, I think it has only been excluded from others higher up the mountains in favour of the far more striking *Araucaria excelsa*. Moreover from its present restricted area it appears to be a declining type, which may, when more widely distributed, and possibly in presence of fewer competing species in remote Eocene time, have sustained greater extremes of climate.

Taking the species, however, as it exists, and apart from any such possibilities, uniformitarians have, it seems to me, but to account for an increase of 14° to 15° , that is if Bournemouth were near its northern limit, as seems probable from its having grown at or near the sea-level.

Supposing, as all evidence tends to prove, that Northern Europe and America were connected by continuous land in Eocene time, would not the mere fact of shutting off the Arctic Seas cause a general and perhaps sufficient rise of temperature? In N. lat. 70° Prince Albert Land has a mean of only 5° Fahr., and Lapland one of 32° , a difference of no less than 27° , caused solely by the presence of an Arctic ice-laden current. The general cooling effect of incessant oceanic circulation between the North Pole and the Tropics is, I think, scarcely taken into sufficient account, and although it may be contended that conversely the northerly flow of the Gulf Stream mitigates climate, I think that its action in Europe is chiefly in fending off the ice-laden currents from our coasts, the limit of trees penetrating quite as far north in Siberia away from the coast as at the North Cape, where they are under its influence. J. STARKIE GARDNER

Order Zeuglodontia, Owen

IN August 1848 H.M.S. *Dædalus* encountered off St. Helena a marine animal, of which a representation appeared in the *Illustrated News* of the latter part of that year. It is thirty-two years since I saw this figure, but I recollect that it was one of a blunt-nosed animal with a neck carried about four feet above the water, which was so long as to present the appearance of a serpent; and I remember that Prof. Owen, in combating at the time the idea that this was a sea-serpent, pointed out that the position of the gape in relation to the eye, as shown in the figure in the *Illustrated News*, was that of a mammal, and not that of a reptile; in consequence of which he argued that the animal seen was probably only a leonine seal, whose track through the water gave an illusory impression of great length. This idea, however, seemed to me untenable in the face of the representation in the *Illustrated News*; but it was obvious that to afford the buoyancy necessary for the support above the water of so long a neck (estimated on that occasion as sixty feet, though only the part near the head was actually out of the water), the submerged portion of the animal could not have had the shape of a serpent.

Two or three years after this, on reading the description of *Zeuglodon cetoides*, from the Tertiary (probably Upper Eocene) formations of Alabama, it struck me that the animal seen from the *Dædalus* may have been a descendant of the order to which *Zeuglodon* belonged; and I have ever since watched with interest for reports of the "great sea-serpent."

Three years ago the following appeared in the newspapers:—

"Borough of Liverpool, in the County Palatine of Lancaster to wit.

"We the undersigned, captain, officers, and crew of the barque *Pauline* (of London) of Liverpool, in the county of Lancaster, in the United Kingdom of Great Britain and Ireland, do solemnly and sincerely declare that on July 8, 1875, in lat. $50^{\circ} 3' S.$, long. $35^{\circ} W.$, we observed three large sperm-whales, and one of them was gripped round the body with two turns of what appeared to be a huge serpent. The head and tail appeared to have a length beyond the coils of about 30 feet, and its girth 8 or 9 feet. The serpent whirled its victim round and round for about fifteen minutes, and then suddenly dragged the whale to the bottom head first.

"GEORGE DREVAR, Master

"HORATIO THOMPSON

"JOHN HENDERSON LANDELLS

"OWEN BAKER

"WILLIAM LEWARN

"Again, on July 13, a similar serpent was seen about 200 yards off, shooting itself along the surface, head and neck being out of the water several feet. This was seen only by the captain and one ordinary seaman, whose signatures are affixed.

"GEORGE DREVAR, Master."

"A few moments after it was seen elevated some sixty feet perpendicularly in the air by the chief officer and the following able seamen, whose signatures are also affixed—

"HORATIO THOMPSON

"WILLIAM LEWARN

"And we make this solemn declaration, &c.

"Severally declared and subscribed at Liverpool aforesaid, the 10th day of January, 1877, before

"T. S. RAFFLES, J.P. for Liverpool."

The locality here specified was about thirty miles off the northern coast of Brazil.

In this account I thought that I recognised the grip of the whale by the long neck of the attacking animal, the appearance being confounded into the double coil of a serpent by the distance and motion of the objects; but in face of the general ridicule which has been attached to this subject, and being without any assurance that the declaration so purporting to be made was genuine, I did not venture to ventilate my long-cherished idea. A relative of mine, however, just returned from India, chancing to say that two of the officers of the steamer in which she went out had on the previous voyage witnessed an immense animal rear its neck thirty feet out of the water, and that a sketch of the object had been instantly made, and on reaching port sent to the *Graphic*, I obtained the number of that paper for July 19, 1879, and I inclose a tracing of the figures in it, which are accompanied by the following statement in the *Graphic*:—

"The accompanying engraving is a *fac-simile* of a sketch sent to us by Capt. Davison, of the steamship *Kiushiu maru*, and is inserted as a specimen of the curious drawings which are frequently forwarded to us for insertion in the pages of this journal. Capt. Davison's statement, which is countersigned by his chief officer, Mr. McKechnie, is as follows:—'Saturday, April 5, at 11.15 a.m., Cape Satano distant about nine miles, the chief officer and myself observed a whale jump clear out of the sea, about a quarter of a mile away. Shortly after it leaped out again, when I saw that there was something attached to it. Got glasses, and on the next leap distinctly saw something holding on to the belly of the whale. The latter gave one more spring clear of the water, and myself and chief then observed what appeared to be a large creature of the snake species rear itself about thirty feet out of the water. It appeared to be about the thickness of a junk's mast, and after standing about ten seconds in an erect position, it descended into the water, the upper end going first. With my glasses I made out the colour of the beast to resemble that of a pilot fish.'"

As I have not been able to find any description of the skeleton of the *Zeuglodon*, I venture to draw attention to the subject through your columns, in the hope that among your many readers in America this letter may attract the notice of some one who will tell us whether what is known of the osseous structure of *Zeuglodon cetoides* is or is not consistent with the representation in the *Graphic*. The remains of this cetacean, supposed to be extinct, indicate, according to Sir Charles Lyell, that it was at least seventy

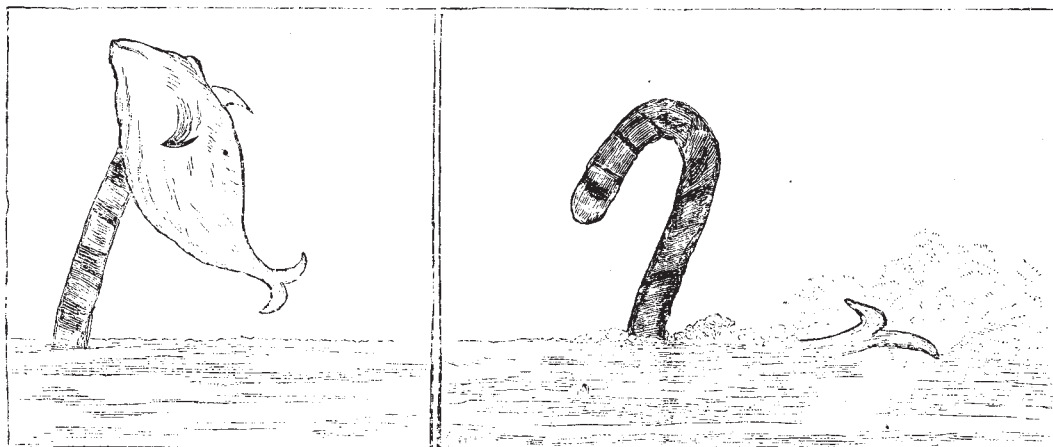
feet in length,¹ while its great double-fanged but knife-edged molars show that it was carnivorous; and as we are not so far removed from the period of the Alabama Tertiaries as to render it improbable that members of what must once have been a great order of carnivorous cetacea, totally distinct from the orders of cetacea hitherto known as living, may still survive, I have braved the ridicule attaching to this subject so far as to invite attention to it.

The second of the two figures in the *Graphic* shows the long-necked animal to possess the cetacean tail, and its head there seems to have been turned from the observer, so that the underside of it only is presented. The first figure shows that the whale had been seized on its flank by the powerful bite of its aggressor, and that to escape from this it had thrown itself out of the water. Having succeeded in this object the second figure shows the aggressor rearing its head and neck out of the water to discover the direction which its prey had taken, in order that it might follow it up; and so far from the charge of curious drawing made by the editor of the *Graphic* being justified, the representation of the whale can be at once recognised as fairly correct; while that of the tail of the unknown animal (which probably prompted this charge), so far from being curious, forms an important piece of evidence as showing the animal in question to be cetacean.

SEARLES V. WOOD, Jun.

Martlesham, near Woodbridge, September 27

P.S.—Since sending to you the above I have again seen my relative, and find that the cut in the *Graphic* of July 19, 1879,



middle and upper divisions are respectively represented by the Coralline and Red Crags of England; and with these "Sables inférieurs" the so-called Miocene of Malta, in which *Zeuglodon* is associated with *Carcharodon*, is probably coeval. Dr. Gibbes (*Jour. Acad. Nat. Sc.*, 2d. ser., vol. i. p. 143), figures and describes teeth of the Antwerp species of *Carcharodon* from both the Eocene of South Carolina and the Miocene of Alabama. These various references bring the *Zeuglodons*, with their *Carcharodon* associates, down to a late geological period, during which they co-existed with Delphinian prey; and of this prey the whale in the woodcut (which looks like a *Grampus*) seems an example.

It is most likely that Bishop Pontoppidan, a copy of the English (1755) edition of whose work I possess, concocted his two figures (one of which is that of a huge snake undulating on the waves, and the other that of a serpent-like animal with pectoral flappers or fins, resting almost on the surface of the sea, with head and tail erect out of the water like the letter U, and spouting water or steam from its mouth in a single column), from accounts given him by Norwegian seamen, some of whom had seen the animal in the position in which it was observed from the *Dadalus*, and others in that in which it is represented in the cut as seen from the *Kiushiu-maru*; for in the long narrative which he gives of the descriptions received from observers at numerous times, some of these agree with the one, and some with the other,

¹ He observes in the third edition of his "Manual of Elementary Geology" (1851), p. 268, that he visited the spot where a vertebral column of this length belonging to *Zeuglodon* had been dug up.

is not that of the instance observed from the steamer in which she came home, which was the *City of Washington*, but of a separate instance which occurred to another ship. I have not been able yet to procure the *Graphic* containing the figure of the animal seen from the *City of Washington*, but she tells me that it was pasted up in the saloon, and represented only the head and long neck of the animal, which was raised to a great height out of the water, and near to the ship; and had been drawn for the *Graphic* by a lady passenger immediately after the occurrence. These repeated and independent notices of the same long-necked animal are, however, the more confirmatory of its existence.

I find that Prof. Owen, in his article on Palæontology in the *Encyclopædia Britannica* (vol. xvii. p. 166), in giving a description of *Zeuglodon cetoides*, says that "the skull is very long and narrow and the nostril single," that Dr. Harlan obtained the teeth on which, correcting Harlan's reptilian reference of them, he founded the order *Zeuglodontia*, from the Miocene of Malta; and that the teeth discovered by Grateloup in the Miocene beds of the Gironde and Hierault, and ascribed by him also to a reptile under the name of *Squaodon*, are those of a smaller species of *Zeuglodon*. The remains of *Squalodon*, along with those of the shark with huge teeth, *Carcharodon megalodon*, and of numerous cetaceans assigned to orders all still living, and of which some, such as *Delphinus*, belong to living genera, occur in the "Sables inférieurs" of Antwerp; which, though long called Miocene, are by M. Vandenbroeck regarded as older Pliocene, and as the base of that series of deposits of which the

though both of the Bishop's figures represent only preposterous conceptions of his own.

[The animal seen from the *Osborne*, and figured in the *Graphic* of June 30, 1877, as the "Sea-serpent," is quite a different thing from the one in question, and may have been a *manatee*.]

Temperature of the Breath

THE interesting observation made by Dr. Dudgeon (*NATURE*, vol. xxii. p. 241, and vol. xxiii. p. 10) to the effect that breathing on the bulb of a thermometer through several folds of flannel or silk raises the temperature of the instrument several degrees above that of the mouth and body, is easily verified. There is no doubt about the accuracy of the observation; but the explanation of it offered by Dr. Dudgeon is not satisfactory. He supposes that the heightened temperature is due to the expired air being hotter—not cooler, as is usually believed—than the mouth and body. A simple experiment sufficed to show that this view was untenable. A clinical thermometer was inserted in the cavity of the mouth, and the stem grasped by the teeth in such a way that the bulb lay free in the oral cavity. Inspiration was carried on by the nostrils, and expiration was effected by gently forcing the breath between the loosely-closed lips and the stem of the instrument. The bulb was thus placed in the centre of the stream of expired air and kept free from contact with the tongue and cheeks. Experimenting in this way, I found, at the end of five, and also of ten, minutes that the thermometer marked 97°2'—the temperature under the tongue at the time being 98°4'.